

swimming robot. It was observed that regardless of the laminar or turbulent flow pattern around the robot the relation between speed and frequency holds. This research was a proof of concept for investigating fish propulsion known best for undulatory swimming motion, using polyelectrolyte ion-exchange-metal composite membrane. !23

Paper #: 2716-28

Doped sol-gel materials as a matrix for fast-response photochromic devices and as a porous cladding for fiber optic chemical sensors, pp.194-204

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Abstract: The effect of a porous sol-gel matrix on the optical limiting characteristics of chloroaluminum phthalocyanine (CAP) has been investigated. Excited state singlet-singlet absorption processes are found to be responsible for the fast response characteristics (ps to ns) for CAP doped xerogel glasses. Subsequent inter-system crossing and triplet-triplet absorption processes are responsible for the persistent absorbance (ns to ms) determined by the ISC rate and the phosphorescent lifetime of CAP. Inhomogeneous spectral broadening of CAP in the xerogel matrix relative to alcohol solutions was found to have a significant affect on the relative linear (i.e. ground state) versus non-linear (i.e. optically induced excited state) absorption processes. In addition, the faster absorption recovery observed for CAP in a silica xerogel relative to ethanol solution was attributed to an increased rate of electronic to vibrational internal conversion in the xerogel matrix. Porous xerogel glasses doped with sensor chromophores have also been investigated as a novel cladding for fiber optic chemical sensor devices. The lower refractive index of the sol-gel film makes it a suitable cladding material while the porous channels allow analytes to diffuse into the evanescent field region where they are detected by changes in the photophysics of analyte sensitive chromophores. !9

Paper #: 2716-29

Fabrication of cadmium sulfide thin films by cw Nd:YAG laser deposition, pp.205-214

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Abstract: We report new results on continuous wave Nd:YAG laser deposition of Cadmium Sulfide (CdS) thin films. Cadmium Sulfide has useful piezoelectric, optoelectric,

photo-conductive and semiconductive properties. CdS films have been deposited on various substrates including Soda-lime silicate glass (SLS), NaCl, Alumina (corundum) and copper coated formvar. The thin films were analyzed using x-ray diffraction, SEM, EDS, TEM, and UV/visible transmission spectra. !7

Paper #: 2716-30

Ultrafast multistability in miniature photomechanical vibration suppressors, pp.215-223

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Abstract: It is well known that light has the ability to carry large amounts of information by virtue of its high intrinsic bandwidth and transmission speed. We report on a new class of mechanical fiber devices that are powered by light. In particular, we show that a sensor, logic unit, and actuator function can be built into a mesoscopic polymer optical fiber: The stress sensor converts stress to light, the logic element manipulates the light according to a preprogrammed response, and the actuator provides mechanical displacement. A device that combines all three of these devices into a single monolithic unit can be designed to perform many different smart mechanical and optical logic functions. Furthermore, because optical devices use no electronic components, they allow for highly interconnected architectures of multiple units that result in ultrasmart operation. Such associations of devices, when embedded in a host material, would form an ultrasmart material. We report on the multistable operation of a highly miniaturized vibration stabilizer in a polymer fiber and show that it has an ultrafast photomechanical response. The theory behind the response is also discussed. !9

Paper #: 2716-31

Bending and shape memory effects of modulated gels, pp.224-230

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Abstract: The smart materials based on spatial modulation of the chemical nature of gels have been synthesized. The modulation is achieved by interpenetrating only part of one gel network with another gel network. Therefore, these gels have an internally heterogeneous, or modulated structure. The simplest modulated structure

is a bigel. The bending of the bigel has been studied as a function of temperature. A theoretical model has been used to analyze the bending stress in the bigels. A variety of shapes, including sinusoidal and spiral ones, of the gels at various temperatures can be obtained by designing the modulation pattern of the system. The novel gel functions obtained from the modulation method are based on the fact that the volumes of different gels are sensitive to different environmental aspects. !20

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